REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 1-5 and 11 are presented for consideration. Claim 1 is the sole independent claim. Claims 6-10 have been cancelled without prejudice or disclaimer of subject matter. Claim 1 has been amended to clarify features of the subject invention. Support for these changes can be found in the original application, as filed. Therefore, no new matter has been added.

Applicants request reconsideration and withdrawal of the rejections set forth in the above-noted Office Action.

Claims 1-4, 6, 7 and 11 have been rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 4,922,290 to Yoshitake et al. in view of the published European patent application number 0 820 132 to Ohmi et al., and further in view of U.S. Patent No. 6,442,181 to Oliver et al. Claim 5 has been rejected under 35 U.S.C. § 103 as being unpatentable over that art combination and further in view of U.S. Patent No. 5,920,398 to Iwanaga et al. Claims 8-10 have been rejected under 35 U.S.C. § 103 as being unpatentable over the original art combination and further in view of U.S. Patent No. 5,170,207 to Tezuka et al. Applicants submit that the cited art, whether taken individually or in combination, does not teach many features of the present invention, as previously recited in claims 1-11. Therefore, these rejections are respectfully traversed. Nevertheless, Applicants submit that independent claim 1, as presented, amplifies the distinctions between the present invention and the cited art.

Claim 1 as currently amended includes limitations of cancelled Claims 6 and 8. Applicants submit that the cited art does not teach or suggest such features of the present invention as recited in independent claim 1 as currently amended.

Independent Claim 1 as currently amended is directed to a projection optical apparatus in which an illumination optical system illuminates a pattern of a reticle with laser light from a continuous emission excimer laser and a projection optical system projects the illuminated pattern onto a substrate. An adjusting unit adjusts an optical characteristic of the projection optical system according to a change in wavelength of the laser. A wavelength stabilizing unit stabilizes the wavelength of the laser light when the adjustment of the projection optical system optical characteristic is insufficient. The wavelength stabilizing unit has a piezoelectric device. The wavelength of the laser light is adjusted by driving the piezoelectric device. The half bandwidth of a wavelength spectrum of the laser light is not greater than 0.1 pm. The excimer laser is an ArF excimer laser, and the projection optical system consists of a refractive lens system constituted essentially by SiO_2.

In Applicants' view, Yoshitake et al. discloses a semiconductor exposing system that projects a pattern of a mask onto a semiconductor wafer. In the system, an apparatus corrects an influence on the resolution by a fluctuation in wavelength of a laser light source. The system has a laser light source and an optical projecting system that projects a laser beam emitted from the laser light source onto the semiconductor wafer through the mask. An apparatus receives a part of the laser beam emitted from the laser light source, detects the wavelength fluctuation, and corrects the position and magnification of the optical projecting system in accordance with the

wavelength fluctuation value or an apparatus for correcting the refractive index of the optical projecting system.

In Applicants' opinion, Ohmi et al. discloses an excimer laser oscillator which has a laser chamber that stores a laser gas mixture and in which an inner surface thereof has a reflection free surface with respect to light of a desired wavelength. An uppermost surface of the inner surface consists of a fluoride. An optical resonator made of a pair of reflection mirrors is arranged to sandwich the laser chamber therebetween. The reflectance of the reflection mirror on the output side is 90% or more and a microwave introducing unit is arranged on the laser chamber to continuously excite the laser gas in the laser chamber.

Oliver et al., in Applicants' view, discloses a gas discharge laser capable of operating at pulse rates in the range of 4,000 Hz to 6,000 Hz at pulse energies in the range of 5 mJ to 10 mJ or greater. In the laser, a laser chamber has a gas flow path with a gradually increasing cross section downstream of the discharge electrodes to permit recovery a large percentage of the pressure drop in the discharge region. A squirrel cage type fan produces gas velocities through the discharge region of more than 76 m/s and is capable of continuous trouble-free operation for several months. A heat exchanger system removes in excess of 16 kw of heat energy from the laser gas. A pulse power system provides precisely controlled electrical pulses to the electrodes needed to produce laser pulses at the desired pulse energies in the range of 5 mJ to 10 mJ or greater at pulse repetition rates in the range of 4,000 Hz to 6,000 Hz or greater and a laser beam measurement and control system measures pulse energy wavelength and bandwidth on a pulse-to-pulse laser with feedback pulse-to-pulse control of pulse energy and wavelength.

Tezuki et al., in Applicants' opinion, discloses a projection lens system well-fit for baking integrated circuit patterns onto silicon wafers using a light source having wavelengths ranging from an ultraviolet wavelength zone to a vacuum ultraviolet wavelength zone. This projection lens system has plural lens elements including a Fresnel lens element having negative dispersion characteristics. The Fresnel lens is located at a position lies somewhere in said projection lens system with the exception of the pupil thereof and satisfies the following condition: $2h_{MAX}/3 \leq h$ Here h_{MAX} is the maximum height of a marginal ray in said projection lens system, and h is the height of a marginal ray at the position of said Fresnel lens.

According to the invention defined in Claim 1 as currently amended, the half bandwidth of a wavelength spectrum of the laser light from a continuous emission excimer laser is not greater than 0.1 pm and the projection optical system that projects the illuminated pattern of a reticle onto a substrate consists of a refractive lens system constituted essentially by SiO_2. Advantageously, a projection optical system of the invention is made of a single glass material and is also constituted by refractive optical elements.

With regard to the cited references, Yoshitake et al. may teach a semiconductor exposure apparatus that detects wavelength fluctuation and corrects the position and magnification with wavelength fluctuation values. Ohmi et al. may disclose an excimer oscillator for a continuous emission laser for use in a projection exposure apparatus and Oliver et al. may teach using a piezoelectric device for wavelength tuning. As noted by the Examiner with respect to cancelled Claim 8, neither Yoshitake et al. nor Ohmi et al. teaches a specific projection optical system design or composition. None of Yoshitake et al., Ohmi et al. and Oliver et al. discloses either the

feature of the half bandwidth of a wavelength spectrum of the laser light from a continuous emission excimer laser being not greater than 0.1 pm and of a projection optical system that projects the illuminated pattern of a reticle onto a substrate consisting of a refractive lens system constituted essentially by SiO_2. As a result, it is not seen that any combination of Yoshitake et al., Ohmi et al. and Oliver et al. suggests the added limitations of Claim 1 as currently amended.

Tezuki et al. may show a projection optical system made of SiO_2 and CaF_2. In Tezuki et al., a Fresnel lens which is a diffractive element is used for correction of chromatic aberration. In contrast to Tezuka et al., it is a feature of Claim 1 that the projection optical system consists of a refractive lens system constituted essentially by SiO_2. It is generally known that chromatic aberration is not correctable in an optical system constituted by only refractive elements and made of a single class material. The further feature of Claim 1 that the half bandwidth the wavelength spectrum of the laser light is not greater than 0.1 pm, assures an projection optical system constituted essentially by SiO_2 in which chromatic aberration is very well suppressed or corrected. As a result, it is not seen that the use of a diffractive Fresnel lens element of Tezuki et al. could in any manner suggest a projection optical system consisting of a refractive lens system constituted essentially by SiO_2 combined with the half bandwidth the wavelength spectrum of the laser light being not greater than 0.1 pm. Accordingly, none of Yoshitake et al., Ohmi et al., Oliver et al. and Tezuki et al. is believed to teach or suggest the feature of a projection optical system consisting of a refractive lens system constituted essentially by SiO_2 combined with the feature of the half bandwidth the wavelength spectrum of the laser

light being not greater than 0.1 pm. It is therefore believed that Claim 1 as currently amended is completely distinguished from any combination of Yoshitake et al., Ohmi et al., Oliver et al. and Tezuki et al. and is allowable.

For the foregoing reasons, Applicants submit that the present invention, as recited in independent claim 1, is patentably defined over the cited art.

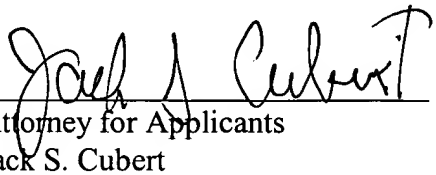
Dependent claims 2-5 and 11 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in independent claim 1. Further individual consideration of these dependent claims is requested.

Applicants further submit that this Amendment After Final Rejection clearly places this application in condition for allowance. This Amendment was not earlier presented because Applicants believed that the prior Amendment placed the application in condition for allowance. Accordingly, entry of the instant Amendment, as an earnest attempt to advance prosecution and reduce the number of issues, is requested under 37 CFR 1.116.

Applicants submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicants' attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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